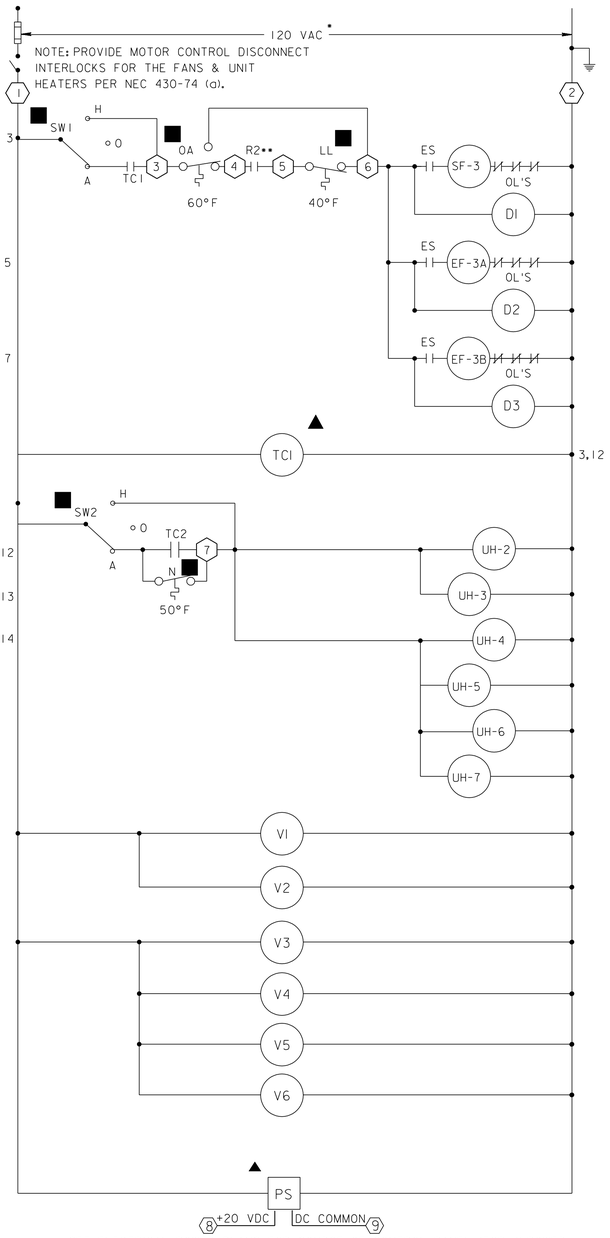


• SEE ELECTRICAL POWER PLANS FOR SOURCE OF CONTROL PANEL (TCP-4) POWER.

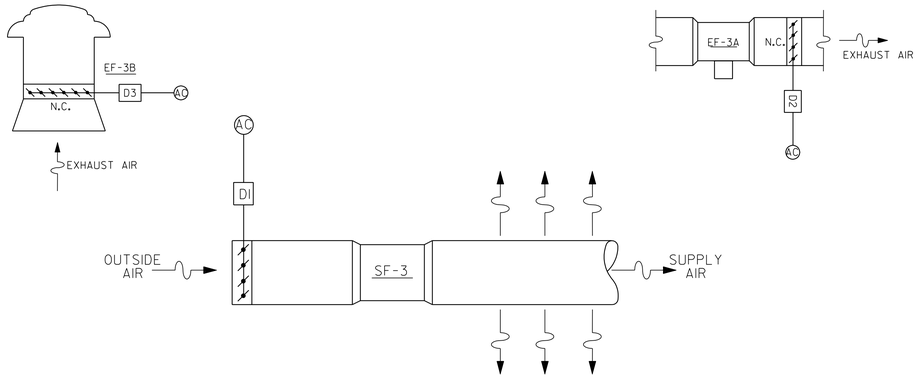
•• FROM RELAY R2 ASSOCIATED WITH THE HW SYSTEM.

ELEMENTARY DIAGRAM

EXPLOSION-PROOF REQM'TS: ALL CONTROLS LOCATED WITHIN HAZARDOUS AREAS SHALL BE SUITABLE FOR USE IN A CLASS I, DIVISION I, GROUP D AREA. SEE SHT. E-10 FOR LOCATION OF HAZARDOUS AREAS.

HVAC CONTROLS SYSTEM

This HVAC control system was designed using Barber-Coleman controls as a reference. Other manufacturer's controls are permitted as long as the strategies and accuracy of control are not changed. The drawings shown are used to define the required drawing detail of the Temp. Control Submittals. Actual terminal numbering, control components, and control setpoints shall be documented on Contractor submittals as required by the Specification SECTION 15895.



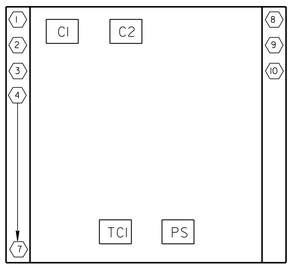
CONTROL SCHEMATIC

DESCRIPTION OF COMPONENTS

TC1	A SEVEN DAY TIMECLOCK WITH A MINIMUM OF 7 ON AND 7 OFF SWITCH TRIPPERS (FULLY ADJUSTABLE). THE MINIMUM OUTPUT IS TWO SPDT RELAYS. THE TIMECLOCK SHALL HAVE AN 8 HOUR SPRING BACKUP OR CONTINUOUSLY CHARGED BATTERY BACKUP.
SW1	AN EXPLOSION-PROOF, HAND-OFF-AUTO MANUAL SELECTOR SWITCH. 120 VAC
SW2	SAME AS SW1.
D1-3	AN ELECTRIC DAMPER ACTUATOR, TWO POSITION, WITH SPRING RETURN. OPERATING VOLTAGE SHALL BE 120 VAC.
OA	AN ELECTRIC, REMOTE OUTDOOR, TWO-POSITION THERMOSTAT WITH A DIFFERENTIAL OF 4°F (FIXED OR ADJUSTABLE). SETPOINT SHALL BE ADJUSTABLE 40-70°F MINIMUM AND SHALL MAKE ON A DROP IN TEMP.
ES	DAMPER END SWITCH (TYP.)
N	AN ELECTRIC, TWO-POSITION NIGHT THERMOSTAT WITH A DIFFERENTIAL OF 4°F (FIXED OR ADJUSTABLE). SETPOINT SHALL BE ADJUSTABLE 45-60°F MINIMUM. THERMOSTAT SHALL HAVE TWO SETS OF CONTACT THAT CLOSE UPON A DROP IN TEMPERATURE BELOW SETPOINT.
LL	AN ELECTRIC, EXPLOSION PROOF, TWO-POSITION LOW-LIMIT THERMOSTAT WITH A DIFFERENTIAL OF 4 F (FIXED OR ADJUSTABLE). SETPOINT SHALL BE ADJUSTABLE 40-55 F MINIMUM. THERMOSTAT SHALL HAVE CONTACT THAT CLOSE UPON A DROP IN TEMPERATURE BELOW SETPOINT.
PS	A REGULATED DC VOLTAGE POWER SUPPLY COMPATIBLE WITH ALL COMPONENTS REQUIRING DC VOLTAGE.
S1	REMOTE, ELECTRONIC, EXPLOSION-PROOF SPACE TEMPERATURE SENSOR COMPATIBLE WITH ASSOCIATED CONTROLLER.
S2	SAME AS S1.
C1	AN ELECTRONIC, PROPORTIONAL, SINGLE INPUT TEMPERATURE CONTROLLER WITH A THROTTLING RANGE OF 4 DEGREES F (FIXED OR ADJUSTABLE) AND DIRECT ACTION.
C2	SAME AS C1.
V1	AN ELECTONIC 3-WAY VALVE ACTUATOR, SPRING RETURN WITH A PROPORTIONAL DRIVE COMPATIBLE WITH ASSOCIATED CONTROLLER. OPERATING RANGE SHALL BE 6-9 VDC.
V2-6	SAME AS V1.

LEGEND

SP	SETPOINT
TR	THROTTLING RANGE
NC	NORMALLY CLOSED
NO	NORMALLY OPEN
C	COMMON
DA	DIRECT ACTION
RA	REVERSE ACTING
⬡	ELECTRICAL TERMINAL POINT
▲	MOUNT IN UNIT CONTROL PANEL
■	MOUNT IN SPACE



UNIT CONTROL PANEL DETAIL

NO SCALE

1. INSTALL COMPONETS IN THE LOCATION INDICATED.
2. CONTROL PANEL SHALL BE SECURELY MOUNTED ON THE WALL WHERE SHOWN.
3. USE A CONSISTENT COLOR CODED WIRING SCHEME.
4. LABEL ALL WIRING ENTERING AND LEAVING THE CONTROL PANEL.
5. CONNECT TO THE ELECTRICAL TERMINAL STRIP SHALL BE IN ACCORDANCE WITH THE CONTROL SCHEMATIC AND THE ELEMENTARY DIAGRAM.
6. LINE VOLTAGE TEST POINTS AND DC VOLTAGE TEST POINTS SHALL BE ON OPPOSITE SIDES OF THE PANEL.

SEQUENCE OF CONTROL

GENERAL: THE SYSTEM CONSISTS OF AN IN-LINE EXHAST FAN (EF-3) AND A ROOF-MOUNTED EXHAUST FAN (EF-3B) INTERLOCKED WITH A 100 PERCENT OUTSIDE-AIR SUPPLY FAN (SF-3). IN ADDITION: A SET OF 6 VERTICAL THROW UNIT HEATERS (UH-3 THRU 7) ARE PROVIDED.

TIMED CONTROLS: THE SYSTEM INCLUDES A SEVEN DAY TIMECLOCK (TC) WHICH SHALL PLACE THE SYSTEM IN THE OCCUPIED OR UNOCCUPIED MODE.

SAFETY CONTROLS:

HOT WATER SYSTEM INTERLOCK. IF THE BOILER HOT WATER PUMP IS NOT CIRCULATING (THRU FLOW SWITCH CONTACTS R2) WHEN OUTDOOR TEMPERATURES ARE BELOW 60° F (THRU OUTDOOR THERMOSTAT OA), POWER SHALL BE INTERUPTED TO THE SUPPLY AND EXHAUST FANS AND THEIR ASSOCIATED DAMPERS SHALL CLOSE.

SPACE LOW LIMIT (LL) THERMOSTAT SHALL, AT SPACE TEMPERATURES BELOW 40° F (ADJUSTABLE), STOP THE SUPPLY AND EXHAUST FANS AND CLOSE THEIR ASSOCIATED DAMPERS.

SUPPLY FAN CONTROL. WITH ALL SAFETY CONTROLS CLOSED AND WITH THE HAND-OFF-AUTO SWITCH IN THE "AUTO" POSITION, THE SUPPLY FAN SHALL BE CONTROLLED BY THE TIMECLOCK. OUTSIDE-AIR DAMPER END SWITCH (ES) CONTACTS MUST BE MADE BEFORE THE SUPPLY FAN CAN BE ENERGIZED.

EXHAUST FAN CONTROLS: THE EXHAUST FANS AND ASSOCIATED EXHAUST DAMPERS SHALL BE INTERLOCKED WITH THE SUPPLY FAN TO RUN WHEN THE SUPPLY FAN IS OPERATING. EXHAUST FANS RESPECTIVE DAMPER END SWITCH (ES) CONTACTS MUST BE MADE BEFORE THE EXHAUST FAN CAN BE ENERGIZED.

UNIT HEATER CONTROLS:

OCCUPIED MODE. DURING THE OCCUPIED MODE, THRU TIMECLOCK CONTACTS (TC2), AND WITH THE HAND-OFF-AUTO SWITCH IN THE "AUTO" POSITION: ALL UNIT HEATER FANS SHALL RUN CONTINUOSLY. SPACE TEMPERATURE SHALL BE MAINTAINED, THRU SPACE TEMPERATURE SENSORS (S1 & S2) AND ASSOCIATED CONTROLLERS (C1 & C2), BY SIMUTANEOUSLY MODULATING THE ASSOCIATED UNIT HEATER 3-WAY CONTROL VAVLES (V1 THRU V6) TO MAINTAIN 60° F (ADJUSTABLE).

UNOCCUPIED MODE. DURING THE UNOCCUPIED MODE, NIGHT THERMOSTAT (N) SHALL CYCLE ALL UNIT HEATER FANS ON TO MAINTAIN A SPACE SETBACK TEMPERATURE OF 50° F (ADJUSTABLE).

EXAMPLE FINAL DESIGN

COMPUTER AIDED DESIGN & DRAFTING

$$ – THINK VALUE ENGINEERING – $$

Revisions

Symbol	Descriptions	Date	Approved

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
OMAHA, NEBRASKA

Designed by: R.R.T.	SITE NAME: OMAHA DISTRICT DESIGN GUIDE		SITE LOCATION
Drawn by: S.L.M.	**HVAC CONTROLS (3-BAY SYSTEM)**		
Checked by: G.D.R.			
Reviewed by: K.A.H.	Plot Scale Ratio: 1:12	Date: JUNE 2002	Sheet reference number: M6.4
Submitted by: Chief: MECH. FAC. Section	Design File: STD07: oddgm604.dgn		
	Spec. No.: DACA 45	Drawing Code: X	
	Contract No.: DACA 45		

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